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Combining Automated and Peer Feedback for Effective Learning Design in Writing Practices

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Abstract: The provision of formative feedback has been shown to support self-regulated learning for improving students' writing. Formative peer feedback is a promising approach, but requires scaffolding to be effective for all students. Automated tools making use of writing analytics techniques are another useful means to provide formative feedback on students' writing. However, they should be applied through effective learning designs in pedagogic contexts for better uptake and sense-making by students. Such learning analytics applications open up the possibilities to combine different types of feedback for effective design of interventions in authentic contexts. A framework combining peer feedback and automated feedback is proposed to design effective interventions for improving student writing. Automated feedback is augmented by peer feedback for better contextual feedback and sense making, and peer feedback is enhanced by automated feedback as scaffolding, thus complementing each other.

Keywords: writing analytics, learning design, learning analytics, peer feedback

1. Introduction

Effective learning involves various means of acquiring knowledge and skills like setting up goals, managing resources and regulating motivations and thinking. Such self-regulated learning of students can be supported by providing formative feedback (Nicol & Macfarlane-Dick, 2006). Formative feedback on current work facilitates students to use it for improving current and future work, thereby closing the feedback loop (Sadler, 1989). In writing practices, formative feedback has been provided to students in many sources and forms, including instructor, peer and automated feedback.

Although instructor feedback is most commonly used, it is time consuming and requires considerable effort by the instructor, especially in large cohorts. An alternative is the use of peer feedback, where students make judgements about the performance of each other and provide feedback or marking. Formative peer assessments provide greater immediacy, timeliness, and individualization of feedback via corrective, confirmatory and suggestive feedback (Topping, Smith, Swanson, & Elliot, 2000). Peer feedback and discussion on students' writing also enable students to learn from each other (Allal, Lopez, Lehraus, & Forget, 2005). However, the usefulness of peer feedback depends on the quality of feedback provided, and might vary among students leading to inconsistencies in its application. As a result, peer feedback is often implemented alongside scaffolding that supports its efficacy.

An alternative strategy to providing feedback is through automated assessment. Writing analytics tools offer the potential for automated formative feedback on students' drafts based on different text features. Such tools can provide timely and consistent feedback on students' writing, but have to be implemented cautiously for better uptake and use by students. A pedagogic approach of embedding such automated tools in authentic subject designs has been emphasized as a means to align learning analytics with learning design (Lockyer, Heathcote, & Dawson, 2013; Shibani, Knight, Buckingham Shum, & Ryan, 2017). However, there are inherent limitations in such tools since they lack human context while providing feedback. The current design thus proposes a framework that combines known effective practices like peer feedback and discussion with automated feedback, to overcome their limitations and complement each other.

2. Previous Work

Previous work in this area includes the development and use of automated tools to provide formative feedback on certain features of students' writing. The previous study in this doctoral research program made use of an automated tool called Academic Writing Analytics (AWA) to provide feedback on rhetorical structures in text. These features guide the reader through the argument structure of a text (Hyland, 2005). To introduce the tool, a pedagogic intervention was designed that embedded the writing analytics tool in a learning analytics platform that provided the capability for students to engage in tasks designed by their instructor to help with their subject (Shibani et al., 2017). The pedagogically grounded intervention enabled students to learn essay writing and revision skills based on rhetorical moves in the context of their subject curriculum using a number of sub-tasks. Students typically followed the set of tasks below as part of this pedagogic activity:

- Matching rhetorical structures to instructor's rubric elements
- Viewing an exemplar revised essay
- Assessment of low quality essay
- Revision of the low quality essay using feedback either provided by the AWA tool dynamically, or by the instructor (static), with a self-assessment of revised essay
- Completion of feedback survey
- Downloading instructor's sample revised essay and own revised essay for reflection

Thus, the writing analytics tool was embedded within a curriculum as a pedagogic intervention for improving students' writing ability by making use of several tasks. This design provided an intervention design for students to learn writing skills, and a platform to deliver the activity, with integrated learning analytics for collecting data for instructors and researchers, and delivering instant feedback to students.

3. Proposed Research

The proposed research will be an extension of the previous study which implemented a pedagogic intervention by making use of several sub tasks and feedback types for essay revision. Preliminary results from the previous study showed positive outcomes in terms of usefulness of the tasks for students to write better essays for their subject. It also identified the need to improve the current form of automated feedback for better interpretation and uptake by students. This will be done by the generation of more meaningful and actionable feedback from the automated writing analytics tool AWA as a part of my future work. It involves design changes to the tool, adding content-based feedback in the form of concept maps, and providing resources for improving students' texts further.

In automated feedback, a significant consideration is the social and sense-making processes involved in their pedagogic use, since learning is a complex social activity (Siemens, 2012). Human sense-making and interpretations are an important means to close the feedback loop in learning analytics practices, but might be difficult to do for non-specialists (Clow, 2014). Such human context is often emphasized while interpreting analytics to gain the most from automated tools. This key aspect should be considered when students use writing analytics tools too, as they might need additional support to interpret and make use of the feedback provided. One way of providing such support is through the provision of peer feedback and discussion, along with instructions. Through discussion, students can interpret automated feedback and discuss writing and revision strategies with their peers. It also overcomes the inherent limitation of automated tools, since a tool's output cannot perfectly match human accuracy in all contexts. The human contextual feedback by peers could help to overcome this gap while working with automated tools, since they can capture features missed by the tool as well.

The proposed work for this doctoral research program is therefore to study the inclusion of an additional component of peer feedback and discussion in the learning design along with automated feedback. As mentioned earlier, peer feedback is an effective strategy in writing instruction where students learn from each other (Allal et al., 2005). Peer discussions are seen to help students think about topics and revise their writing to meet the needs of the reader by broadening their audience and emphasizing the shift from product to process (Nystrand & Brandt, 1989). The rationale is both economic and pedagogical: peer at scale, feedback is less expensive compared to marking by graders,

it is quicker to give feedback, and students are exposed to examples of both poorly and well-written work, promoting more meaningful learning (Topping et al., 2000). However, not all students know how to give useful feedback to peers for improving their work. Clear guidelines should train students (Williams, 1992), and we hypothesise that in addition, automated feedback could provide a scaffold, by provoking peer discussion on whether they understand, and agree with it. Thus, peer discussion and automated feedback complement each other and have immense potential in their combined use for improving students' writing skills as suggested by the proposed framework in Figure 1. This doctoral research will implement this framework in authentic contexts and study the effects based on student outcomes.

Figure 1. Proposed Framework

The combination of learning analytics and human feedback could serve as a powerful way to critique and provide feedback on students' writing. This is partly about ways to develop self-regulated learning and improving the learning design. One consideration is that the automated feedback might restrict the thinking of students regarding features not captured by the tool. This could be overcome by providing instructions to students to critique the automated feedback in addition to their original review. Nevertheless, this kind of scaffolding will be useful for students who lack the ability to provide useful comments to their peers and to identify features without the use of the tool.

4. Research Questions

The overall aim of my research is to develop an effective learning analytics application design to study and impact students' writing in authentic contexts by making use of both automated and peer feedback. The specific research questions are:

1. What is the impact of automated feedback on student writing?
    a. What are students' perceptions of automated feedback?
    b. What is the impact of automated feedback on student revisions?
2. What is the impact of automated feedback when combined with peer discussion on student writing and revisions?
    a. Do students produce higher quality texts when a peer feedback component is added to automated feedback?
    b. How do peer discussion dynamics impact the outcome?
    c. What kinds of automated and peer feedback did students act on?
    d. What is the student self-reported value of peer feedback in combination with automated writing feedback?

5. Methodology

Preliminary results addressing the first research question are reported in Shibani, ***et al.*** (2017), studying the effect of feedback by dividing students into three groups: ***AWA feedback, Instructor feedback*** and ***No feedback,*** to understand the usefulness of different types of feedback while revising an essay in a particular context. To answer the remaining questions, a new study is now in preparation. It will be designed as an extension of the first study by including an additional peer feedback and discussion

component to the task. This design will be supported and implemented by embedding the automated tools within the pedagogic contexts of peer discussion with dyads of students, but it can also be extended to collaborative groups. The study conditions that will be used to study the effects of including peer discussion and automated feedback to the design will include the following comparisons:

- Comparison 1: Comparing the individual and peer outcomes to study the effect of peer discussion on automated feedback.
- Comparison 2: Comparing outcomes with and without automated feedback to study the effect of automated feedback on peer discussion.

Further, the dynamics of the peer discussion will be studied from students' conversations in order to study their effect on outcome, using qualitative analysis building on the work of discourse-centric learning analytics (Knight & Littleton, 2015). The kinds of feedback that students act on, and report as being useful, will be investigated through analysis of peer discussions and survey questions.

6. Conclusion

To summarize, analytical writing is a strategic competency, but the evidence is that students find it challenging to develop, and there are insufficient resources in most educational contexts to provide timely feedback on drafts. This doctoral research focuses on combining automated feedback and peer feedback to design pedagogic interventions for improving students' writing skills. This brings students into the feedback loop in combination with new advances in automated writing feedback, which when effectively integrated, should illuminate a new way to embed writing analytics applications in authentic contexts, and ultimately, improve writing.

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